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LG FLATRON 915 FT PLUS SERVICE MANUAL

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LG FLATRON 915FTPLUS

MODEL

SERVICE MANUAL

SPECIFICATIONS

1. PICTURE TUBE

Size	: 19 inch (Flat Slot Mask)
Deflection Angle	: 90°
Neck Diameter	: 29.1 mm
Phosphor	: P22
Slot Pitch	: 0.24 mm
Low Radiation	: TCO-99
Face Treatment	: AR-ASC coating

2. SIGNAL

2-1. Horizontal & Vertical Sync

1) Input Voltage Level : Low= ≤0.8V, High= ≥2.1V
2) Sync Polarity : Positive or Negative

2-2. Video Input Signal

1) Voltage Level : 0 ~ 0.7 Vp-p
   a) Color 0, 0 : 0 Vp-p
   b) Color 7, 0 : 0.467 Vp-p
   c) Color 15, 0 : 0.7 Vp-p
2) Input Impedance : 75 Ω
3) Video Color : R, G, B Analog
4) Signal Format : Refer to the Timing Chart

2-3. Signal Connector

- 15 Pin D-Sub Connector
- 5-BNC Connector

2-4. Scanning Frequency

Horizontal : 30 ~ 107 kHz
Vertical : 50 ~ 200 Hz

3. POWER SUPPLY

3-1. Power Range

AC 100~120V/200~240V (Auto Select)
50/60Hz, 2.5/1.2A

3-2. Power Consumption

MODE	H/V SYNC	POWER CONSUMPTION	LED COLOR
NORMAL (ON)	ON/ON	less than 140W	GREEN
STAND-BY	OFF/ON	less than 8W	ORANGE
SUSPEND	ON/OFF	less than 8W	
OFF	OFF/OFF	less than 3W	ORANGE

4. DISPLAY AREA

4-1. Active Video Area :

- Max Image Size - 366.0 x 274.5mm (14.40" x 10.80")
- Preset Image Size - 350 x 262 mm (13.78" x 10.31")

4-2. Display Color : Full Colors
4-3. Display Resolution : 1600 Dots x 1200Lines/85Hz
4-4. Video Bandwidth : 235MHz

5. ENVIRONMENT

5-1. Operating Temperature: 10°C ~ 35°C (50°F ~ 95°F) (Ambient)
5-2. Relative Humidity : 8% ~ 80% (Non-condensing)
5-3. Altitude : 5000m

6. DIMENSIONS (with TILT/SWIVEL)

Width	: 470.0 mm (18.50")
Depth	: 470.0 mm (18.50")
Height	: 480.0 mm (18.89")

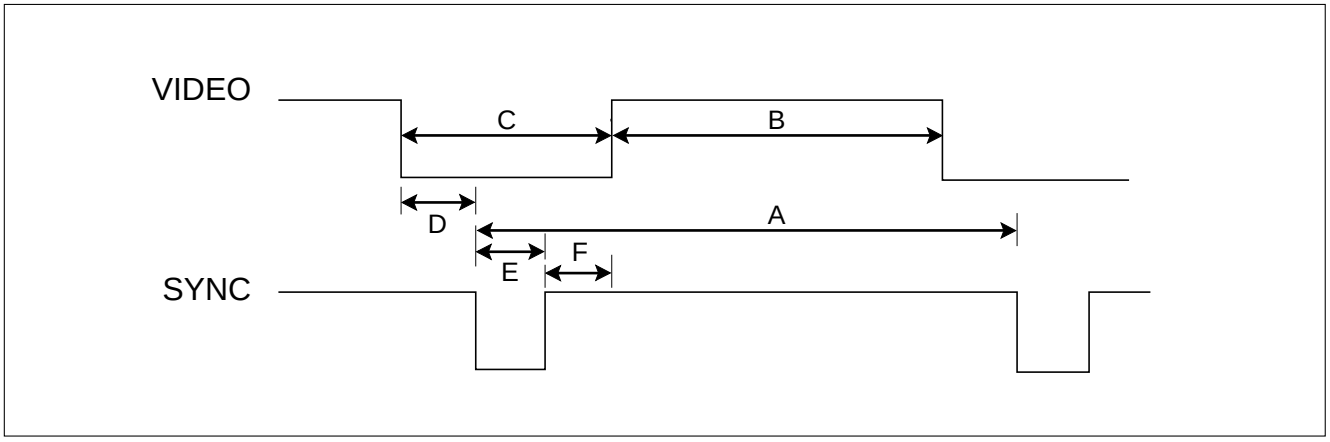
7. WEIGHT (with TILT/SWIVEL)

Net Weight	: 26.5 kg (58.40 lbs)
Gross Weight	: 28.4 kg (62.70 lbs)

8. USB Specifications

USB Standard	: Rev. 1.0 complied self-powered hub
Downstream power supply	: 500mA for each (MAX)
Communication speed	: 12 Mbps (Full), 1.5 Mbps (Low)
USB port	: 1 Upstream port 4 Downstream ports

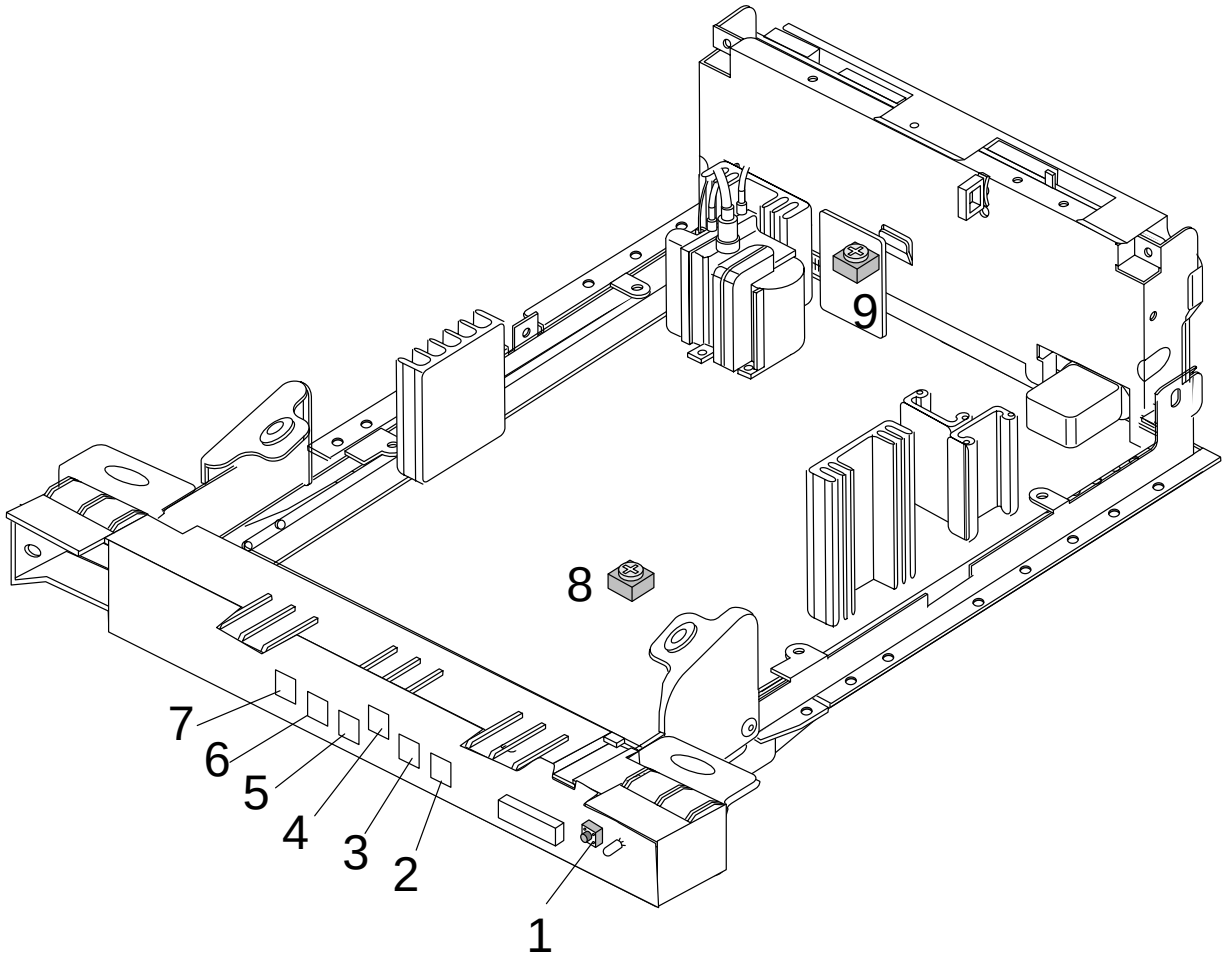
TIMING CHART



<< Horizontal Frequency **(kHz)**, Vertical Frequency **(Hz)**, Horizontal etc... **(µs)**, Vertical etc... **(ms) >>**

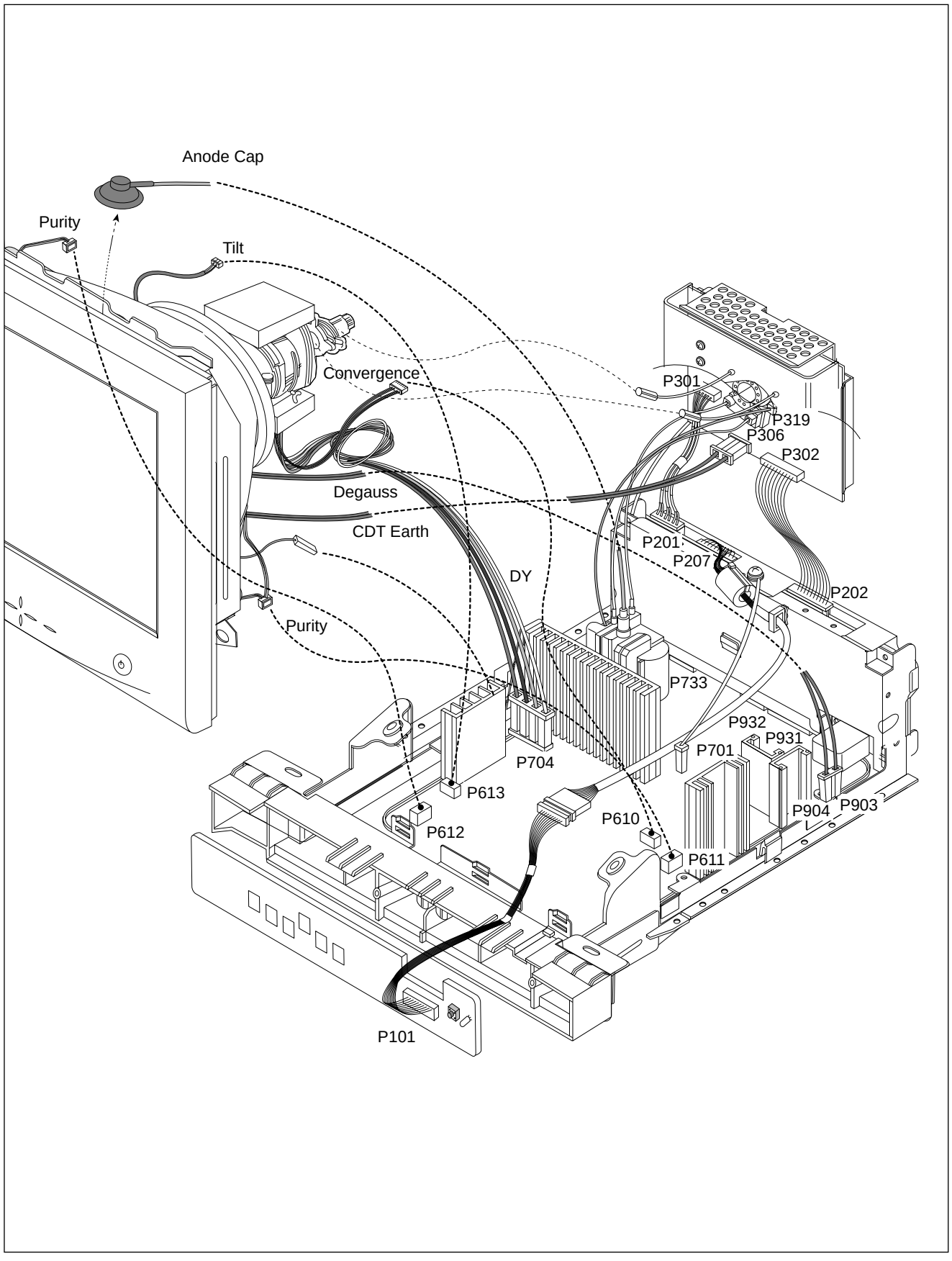
Mode	H/V Sort	Sync Polarity	Frequency	Total Period (A)	Video Active Time (B)	Blanking Time (C)	Front Porch (D)	Sync Duration (E)	Back Porch (F)	Resolution
1	H	–	31.469	31.778	25.422	6.356	0.640	3.810	1.906	**720x400 70Hz**
	V	+	70.082	14.270	12.700	1.557	0.413	0.064	1.08	
2	H	–	31.469	31.778	25.422	6.356	0.640	3.810	1.906	**640x480 60Hz**
	V	–	59.940	16.683	15.253	1.430	0.318	0.064	1.049	
3	H	+	53.674	18.631	14.222	4.409	0.569	1.138	2.702	**800x600 85Hz**
	V	+	85.061	11.756	11.178	0.578	0.019	0.056	0.503	
4	H	+	60.023	16.660	13.003	3.657	0.203	1.219	2.235	**1024x768 75Hz**
	V	+	75.029	13.328	12.795	0.533	0.015	0.044	0.474	
5	H	+	67.500	14.815	10.667	4.148	0.593	1.185	2.370	**1152x864 75Hz**
	V	+	75.000	13.333	12.800	0.533	0.015	0.044	0.474	
6	H	+	68.677	14.561	10.836	3.725	0.508	1.016	2.201	**1024x768 85Hz**
	V	+	84.997	11.765	11.183	0.582	0.015	0.044	0.523	
7	H	+	79.976	12.504	9.481	3.022	0.119	1.067	1.837	**1280x1024 75Hz**
	V	+	75.025	13.329	12.804	0.525	0.013	0.038	0.475	
8	H	+	91.146	10.971	8.127	2.844	0.406	1.016	1.422	**1280x1024 85Hz**
	V	+	85.024	11.761	11.235	0.527	0.011	0.033	0.483	
9	H	+	93.750	10.667	7.901	2.765	0.316	0.948	1.501	**1600x1200 75Hz**
	V	+	75.000	13.333	12.800	0.533	0.011	0.032	0.490	
10	H	+	106.250	9.412	6.972	2.441	0.279	0.837	1.325	**1600x1200 85Hz**
	V	+	85.000	11.765	11.294	0.470	0.009	0.028	0.433	
11	H	–	49.725	20.111	14.525	5.586	0.559	1.117	3.910	**832x624 75Hz**
	V	–	74.550	13.414	12.549	0.865	0.040	0.061	0.764	
12	H	–	68.681	14.560	11.520	3.040	0.320	1.280	1.440	**1152x870 75Hz**
	V	–	75.062	13.322	12.667	0.655	0.044	0.044	0.567	

CONTROL LOCATIONS

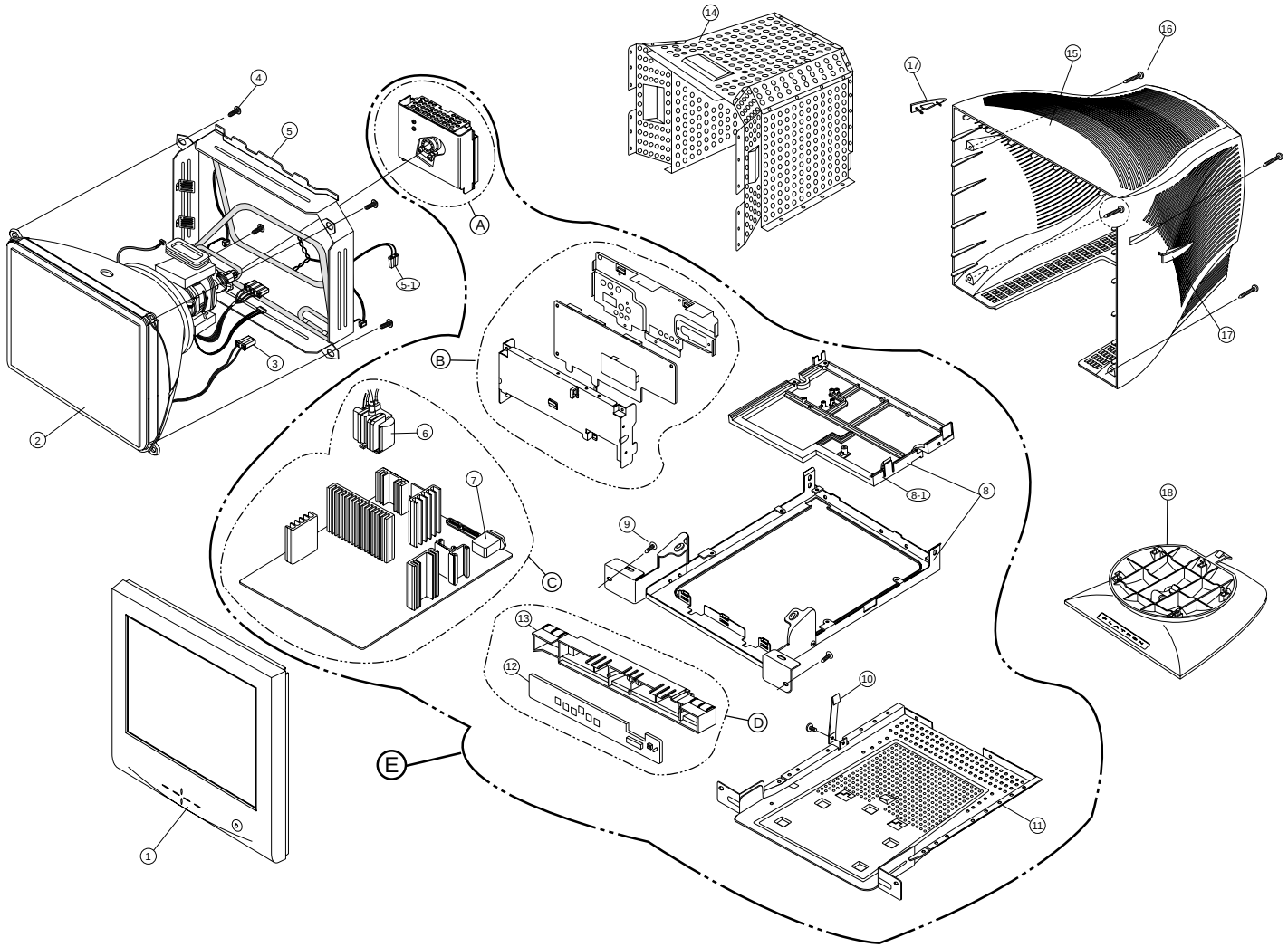


No.	Ref. No.	Control Function	No.	Ref. No.	Control Function
1		POWER SWITCH	6		OSD SELECT/ADJUSTMENT (LEFT)
2		SET BUTTON	7		OSD BUTTON
3		OSD SELECT/ADJUSTMENT (RIGHT)	8	VR901	B^+ ADJUSTMENT
4		OSD SELECT/ADJUSTMENT (UP)	9	VR2061	HIGH-VOLTAGE ADJUSTMENT
5		OSD SELECT/ADJUSTMENT (DOWN)			

WIRING DIAGRAM



EXPLODED VIEW



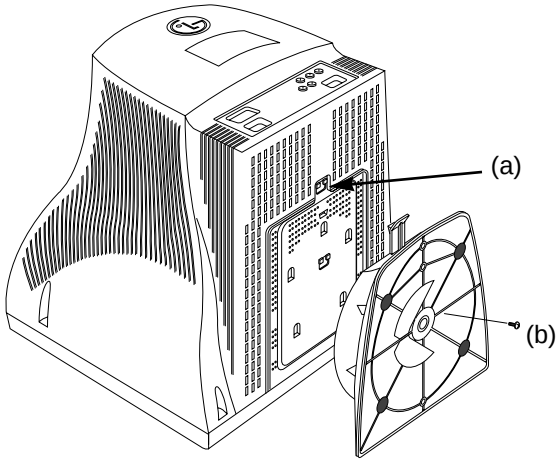
EXPLODED VIEW PARTS LIST

Ref. No.	Part No.	Description	Q'ty	Material
1	3091TKC037B	CABINET ASSY	1	
2	2423GG3E41B	CDT SET, M46QDG423X 01N6LD	1	
3	6868T19001D	CDT EARTH	1	
4	339-002J	SCREW ASSY, PHP+5x25(FZMW1)+GW18	4	
5	4951TKS041A	METAL ASSY, FRAME	1	
5-1	6140TC2008A	DEGAUSSING COIL	1	
6	6174Z-1018D	FBT(FLY BACK TRANSFORMER), FMMTC61-M1018D	1	
7	6200TJB004A	FILTER(CIRC), EMI 03ME3G(3) DELTA	1	
8	4951TKS043A	METAL ASSY FRAME	1	
8-1	4810TKM027E	BRACKET FB915B MAIN ("D"-CORE)	1	
9	332-102E	SCREW, PTP+4x16(FSWR/FZMY)	2	
10	4950TKK117A	METAL, FIX HEAT SINK	1	
11	4951TKS042A	METAL ASSY, SHIELD BOTTOM	1	
12	6871TCH079A	PWB(PCB) ASSY, COMPOSITE FB915 CONTROL BRAND CA-72 HAND	1	
13	4810TKV012A	BRACKET FB915 VOLUME	1	
14	4815TKT009A	SHIELD ASSY, TOP	1	
15	3809TKC021A	BACK COVER ASSY	1	
16	332-122B	SCREW, TP1+M4x16(FZMY1)	4	
17	3550TKK084A	COVER SCREW	2	
18	3043TKK048C	TILT SWIVEL ASSY	1	
A	6871TVT118A	PWB(PCB) ASSY, VIDEO FB915B XKGU BRAND VIDEO TOTAL	1	
B	6871TKT011A	PWB(PCB) ASSY, INTERFACE FB915B TOTAL ASSY	1	
C	6871TMT125A	PWB(PCB) ASS'Y, MAIN FB915B XKGU BRAND CA-72 TOTAL	1	
D	6871TCT079A	PWB(PCB) ASSY, COMPOSITE FB915 CONTROL BRAND CA-72 TOTAL	1	
E	3313T19009A	MAIN TOTAL ASS'Y	1	

DISASSEMBLY

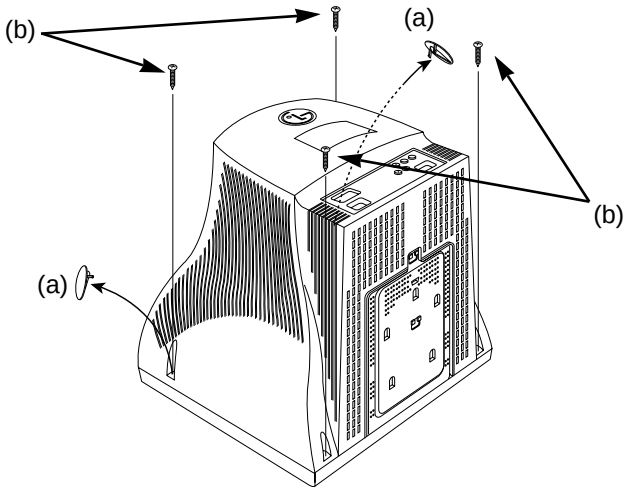
1. TILT/SWIVEL REMOVAL

1) Set the monitor face downward.
2) Remove screw (a).
3) Pressing the latch (b), carefully remove the Tilt/Swivel by pulling it upward.



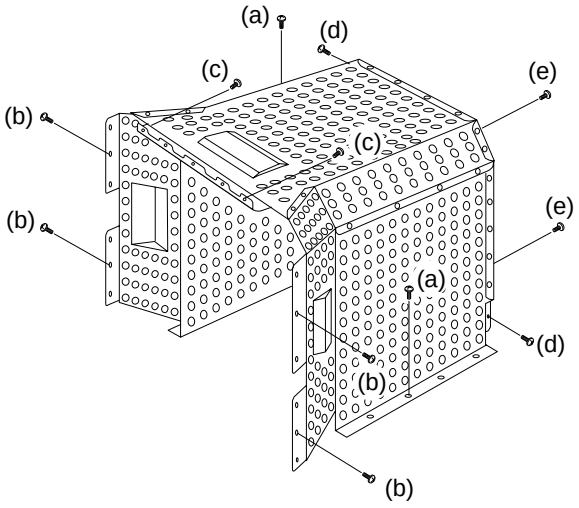
2. BACK COVER REMOVAL

1) Remove two screw covers (a).
2) Remove four screws (b) from the Back Cover.
3) Slide the Back Cover away from the Front Cabinet of the monitor.



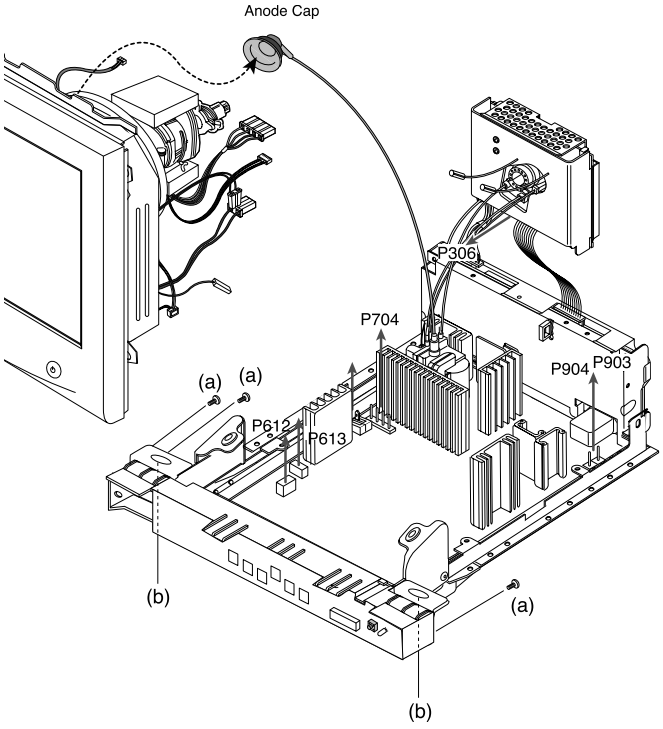
3. TOP SHIELD REMOVAL

1) Remove two screws (a).
2) Remove four screws (b).
3) Remove two screws (c).
4) Remove two screws (d).
5) Remove two screws (e).
6) Slide the Top Shield away from the monitor.



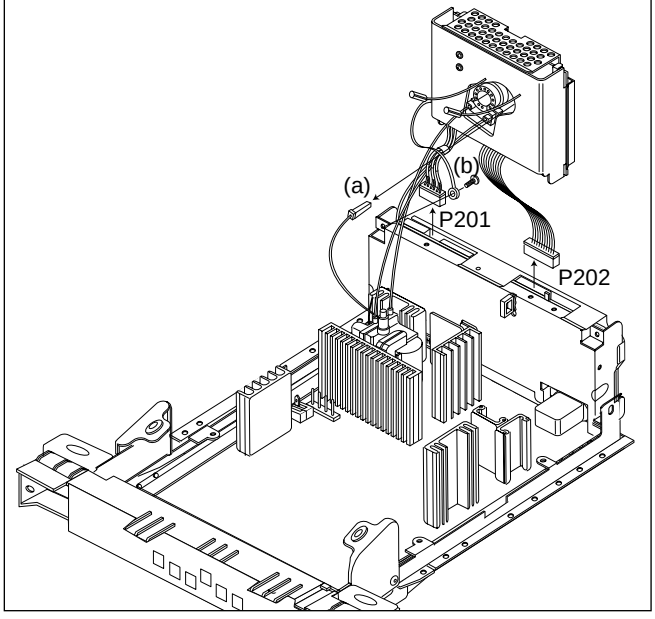
4. TOTAL CHASSIS ASSEMBLY REMOVAL

1) Disconnect P903, P904 (Degaussing pin), P704 (DY pin), P613 (Tilt pin), P610and P611, P612 (Purity pin) from the Main PCB.
2) Disconnect P306 (GND Wire) from the Video PCB.
3) Carefully separate the CDT Board Assembly from the CDT neck.
4) Discharge the remaining static electricity by shorting between the Anode Cap and the CDT ground.
5) Disconnect the Anode Cap from the CDT.
6) Remove three screws (a).
7) Remove two screws (b).
8) Remove the Total Chassis Assembly from the Cabinet.



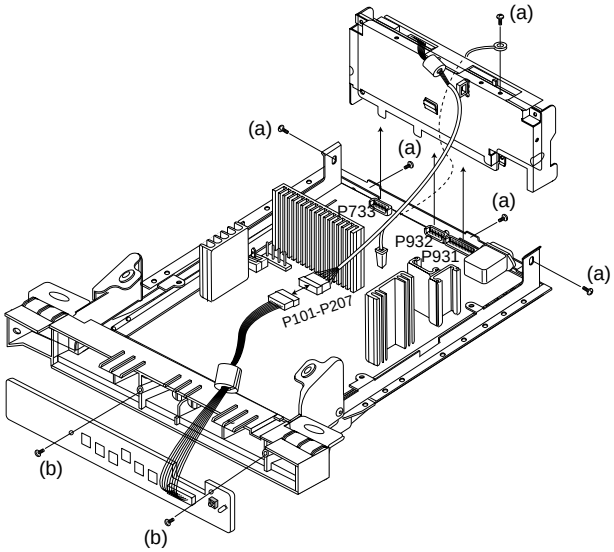
5. VIDEO PCB ASSEMBLY REMOVAL

1) Disconnect P201, P202 and Pin (a) from the Video PCB.
2) Remove screw (b).
3) Remove the Video PCB Assembly from the interface Assembly.



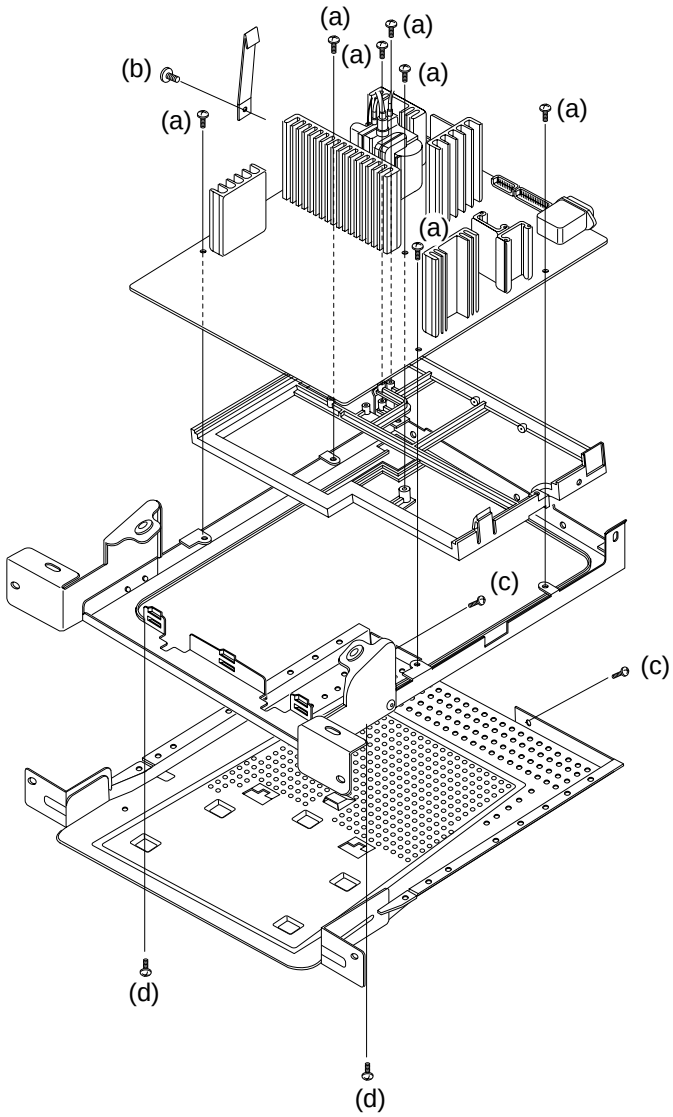
6. INTERFACE & CONTROL PCB ASSEMBLY REMOVAL

1) Remove five screws (a).
2) Carefully remove the interface Assembly from the Main PCB Board.
3) Disconnect P101-P207.
4) Remove two screws (b).
5) Remove the control PCB Assembly.



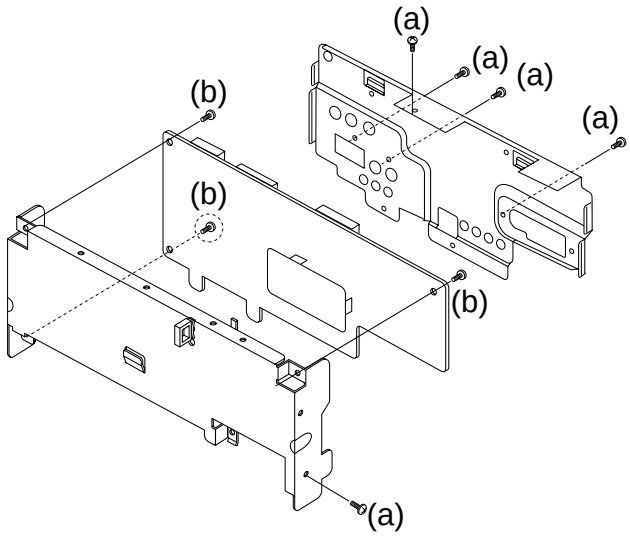
7. MAIN BOARD ASS'Y REMOVAL

1) Remove seven screws (a).
2) Remove screw (b).
3) Remove two screws (c).
4) Remove two screws (d).
5) Remove the Main Bracket and the Bottom Bracket.



8. INTERFACE ASSEMBLY REMOVAL

1) Remove five screws (a).
2) Remove the interface Rear Shield.
3) Remove three screws (b).
4) Remove the Interface Front Shield and Interface PCB.



ADJUSTMENT

GENERAL INFORMATION

All adjustment are thoroughly checked and corrected when the monitor leaves the factory, but sometimes several adjustments may be required.
Adjustment should be following procedure and after warming up for a minimum of 30 minutes.

- Alignment appliances and tools.
  - IBM compatible PC.
  - Programmable Signal Generator.
    (eg. VG-819 made by Astrodesign Co.or equivalent)
  - EPROM or EEPROM with saved each mode data.
  - Alignment Adaptor and Software.
  - Digital Voltmeter.
  - White Balance Meter.
  - Luminance Meter.
  - High-voltage Meter.

AUTOMATIC AND MANUAL DEGAUSSING

The degaussing coil is mounted around the CDT so that automatic degaussing when turn on the monitor. But a monitor is moved or faced in a different direction, become poor color purity cause of CDT magnetized, then press
(DEGAUSSING) on the OSD menu.

ADJUSTMENT PROCEDURE & METHOD

- Install the cable for adjustment such as Figure 1and run the alignment program on the DOS for IBM compatible PC.

1. Adjustment for B^+ Voltage.

1) Display cross hatch pattern at Mode 8.
2) Adjust C951 (+) voltage to 195±0.5V with **VR901**.

2. Adjustment for High-Voltage.

1) Display cross hatch pattern at Mode 8.
2) Adjust CDT Anode voltage to 27±0.5kV with **VR2061**.

3. Adjustment for Factory Mode (Preset Mode).

1) Display cross hatch pattern at Mode 13.
2) Run alignment program for Flatron 915FT(*plus),* FB915B on the IBM compatible PC.
3) EEPROM → ALL CLEAR → Y(Yes) command ÆPower Off ÆPower On.
4) DIST. ADJ. → SIZE-MAX command.
5) Adjust H-SIZE MAX as arrow keys to just of the full screen size at Mode 13.
6) COMMAND →PRESET START→Y(Yes) command.
7) Adjust tilt as arrow keys to be the best condition.
8) DIST. ADJ. → BALANCE command.
9) Adjust balance of pin balance, key balance as arrow keys to be the best condition.
10) DIST. ADJ. → FOS. ADJ command.
11) Adjust H-SIZE as arrow keys to 350±2mm.
12) Adjust H-POSITION as arrow keys to center of the screen.
13) Adjust V-SIZE as arrow keys to 262±1mm.
14) Adjust V-POSITION as arrow keys to center of the screen.
15) Adjust S-PCC (Side-Pincushion) as arrow keys to be the best condition.
16) Adjust TRAPEZOID as arrow keys to be the best condition.
17) Display from Mode 1 to Mode 12 and repeat above from number 11) to 16).
18) PRESET EXIT → Y (Yes) command.

4. Adjustment for White Balance and Luminance.

1) Set the White Balance Meter.
2) Press the (DEGAUSSING) on the OSD menu for demagnetization of the CDT.
3) Display color 0,0 pattern at Mode 8.
4) Set Brightness and Contrast to max position.
5) COLOR ADJ. Æ BIAS ADJ. command of the alignment program.
6) Check whether blue color or not at R-BIAS and G-BIAS to min position and B-BIAS to 215 (decimal) position at Sub-Bright to 85 (decimal). If it's not blue color, the monitor must repair.

7) Adjust Screen control on the FBT to 0.15±0.02FL of the raster luminance.
8) Adjust B-BIAS and Sub-Brightness to 155 (decimal).
9) Adjust R-BIAS and G-BIAS command to x=0.283± 0.006 and y=0.298±0.006 on the White Balance Meter with PC arrow keys.
10) Adjust SUB-Brightness command to 0.5±0.1FL of the raster luminance.
11) Display color 15,0 box pattern (70x70mm) at Mode 8.
12) DRIVE ADJ command.
13) Set B-DRIVE to 150 (decimal) at DRIVE of the alignment program.
14) Adjust R-DRIVE and G-DRIVE command to white balance x=0.283±0.003 and y=0.298±0.003 on the White Balance Meter with PC arrow keys.
15) Adjust SUB-CONTRAST command to 40±1FL of the raster luminance.
16) Display color 15,0 full white patten at Mode 8.
17) COLOR ADJ. → LUMINANCE → ABL command.
18) Set the Brightness and Contrast to max position.
19) Adjust ABL to 32±1FL of the luminance.
20) Exit from the program.

5. Adjustment for Focus.

1) Display H character in full screen at Mode 8.
2) Adjust two Focus control on the FBT so that focus should be the best condition.

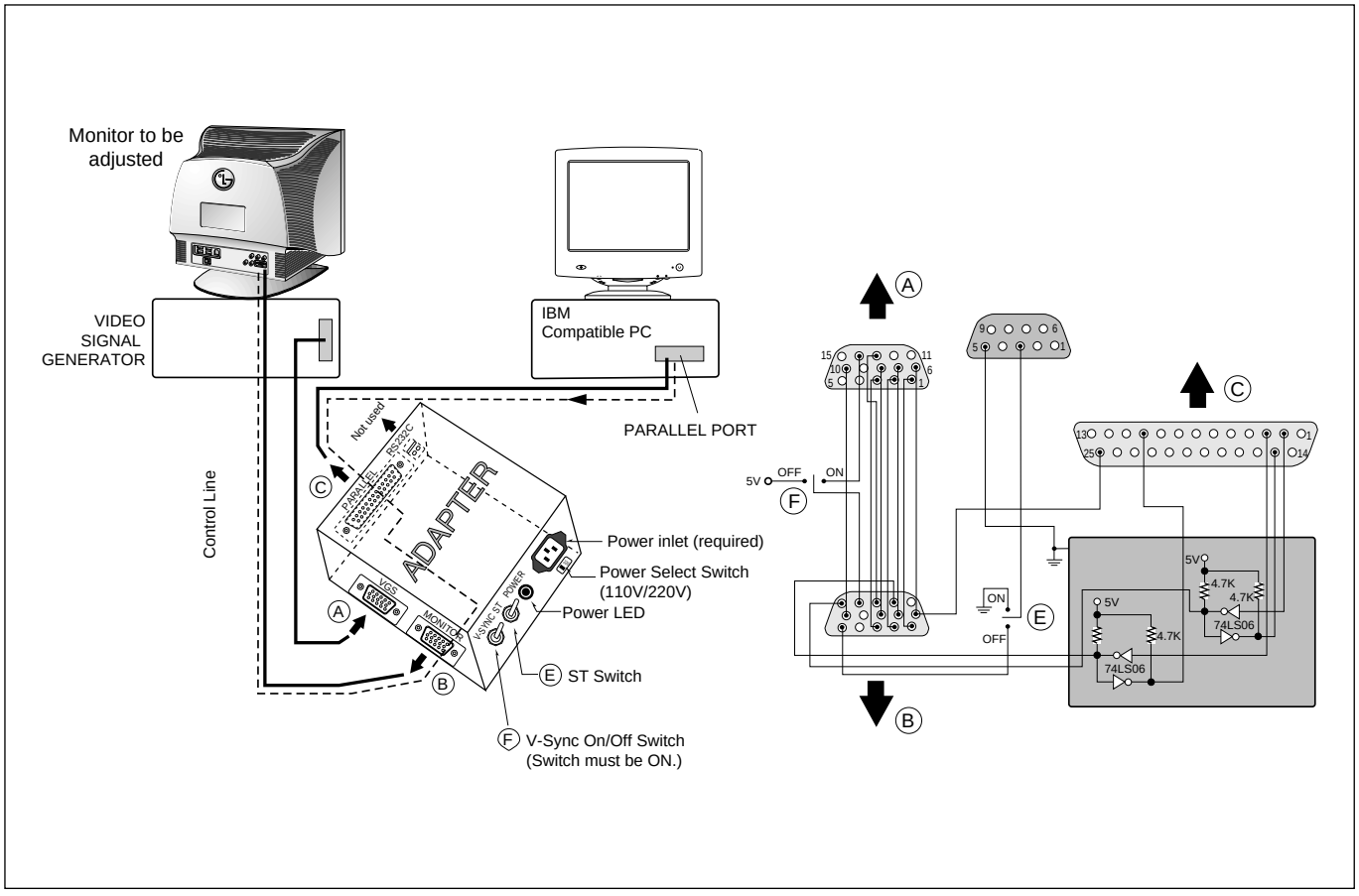
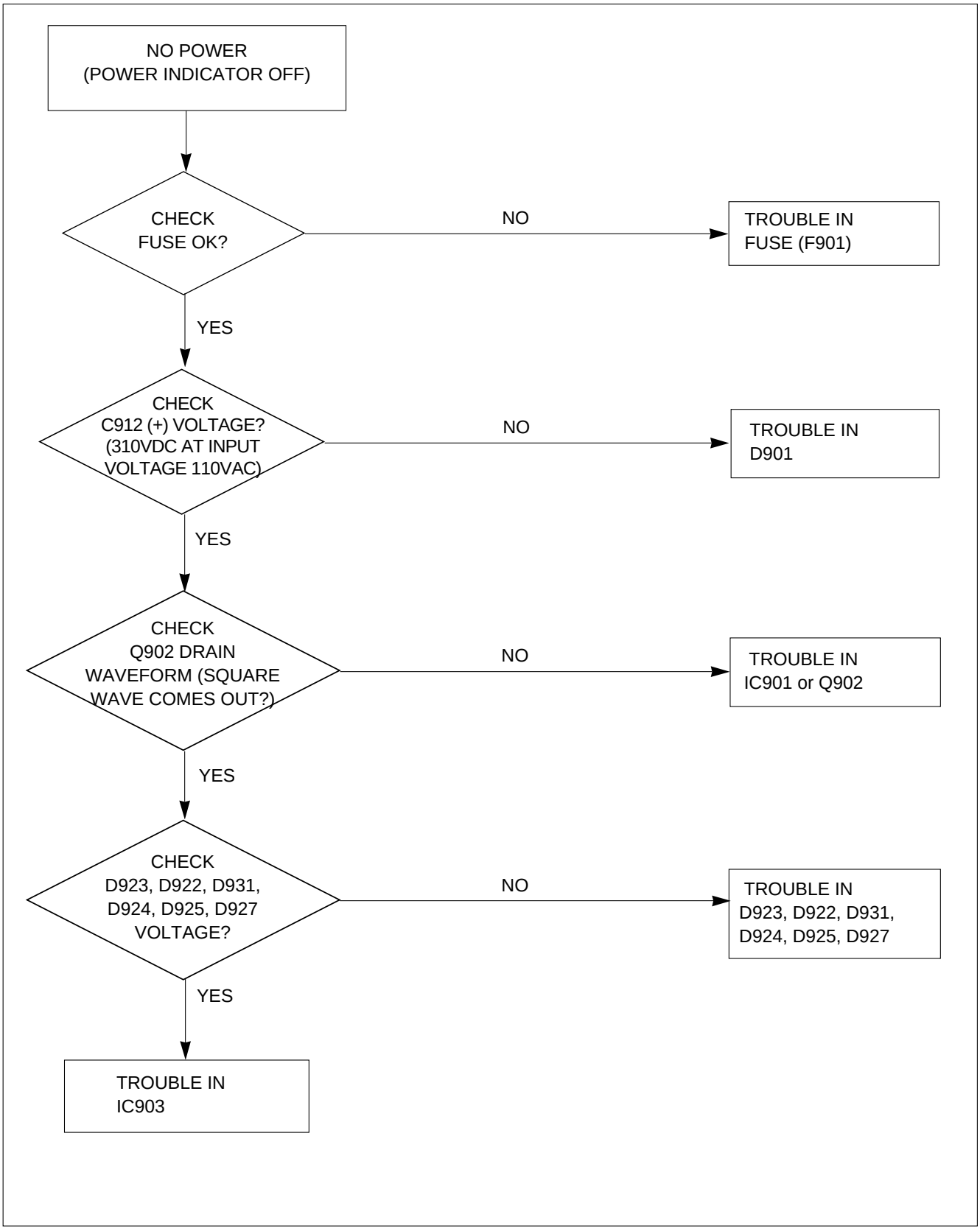


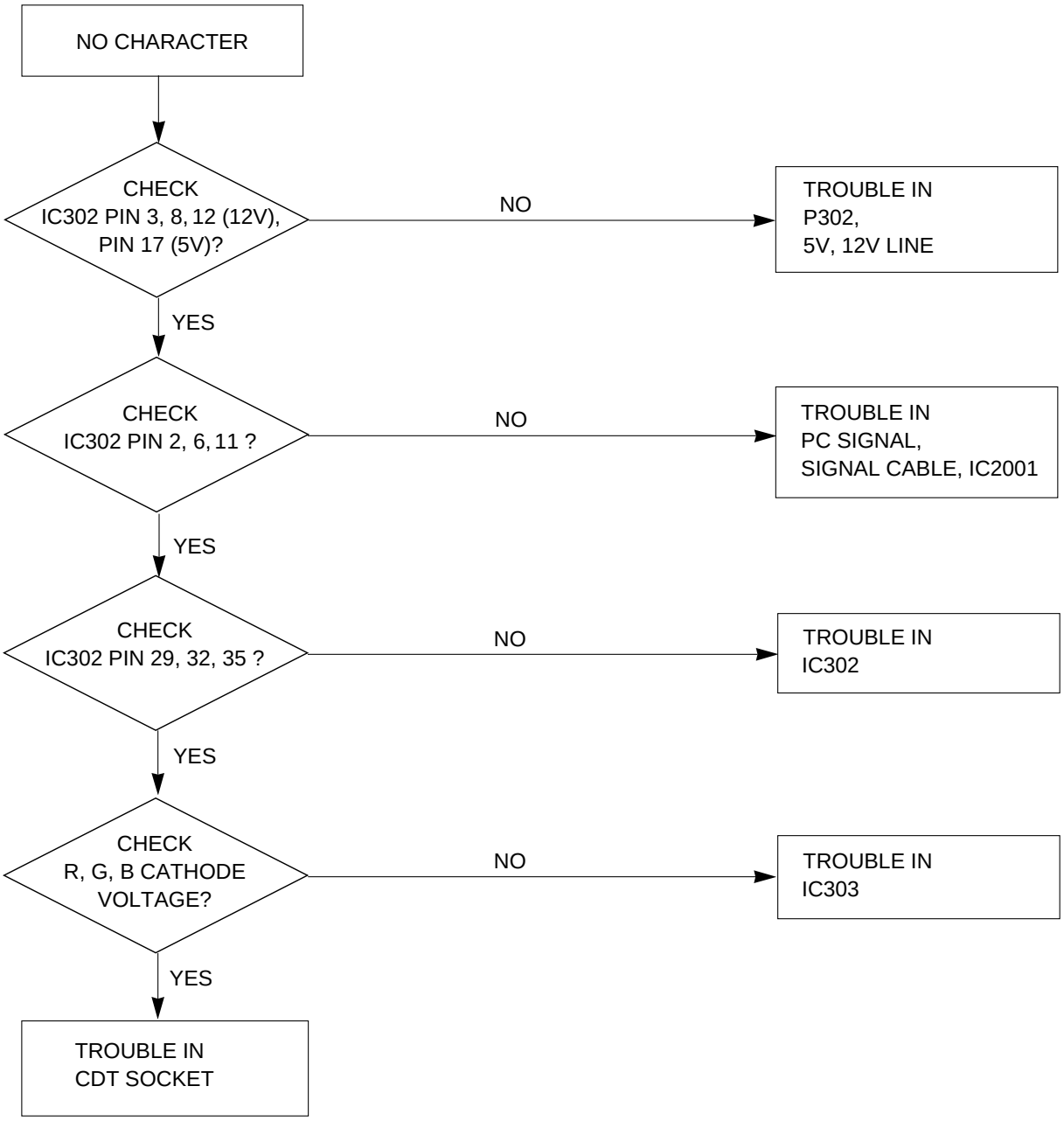
Figure 1. Cable Connection

TROUBLESHOOTING GUIDE

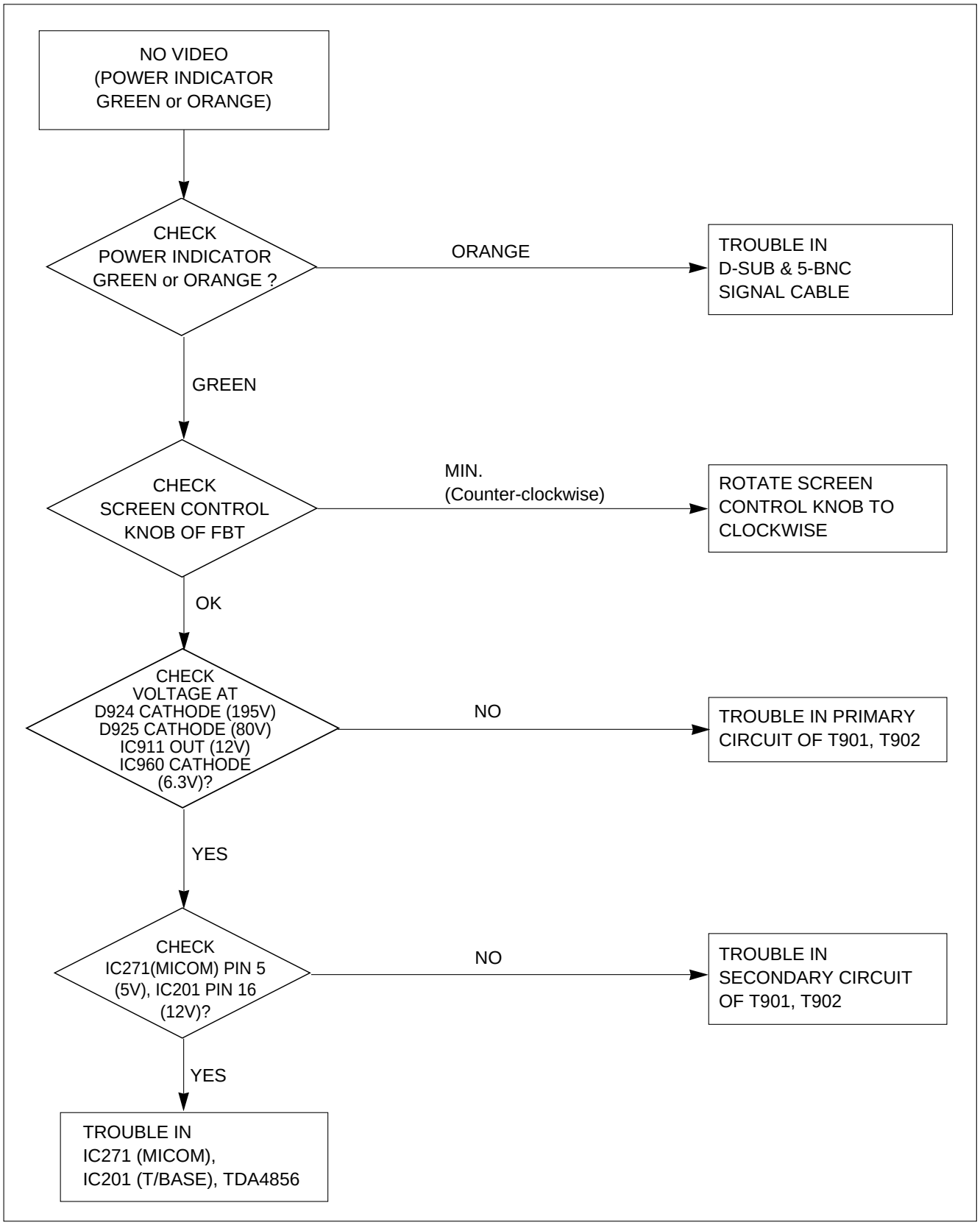
1. NO POWER



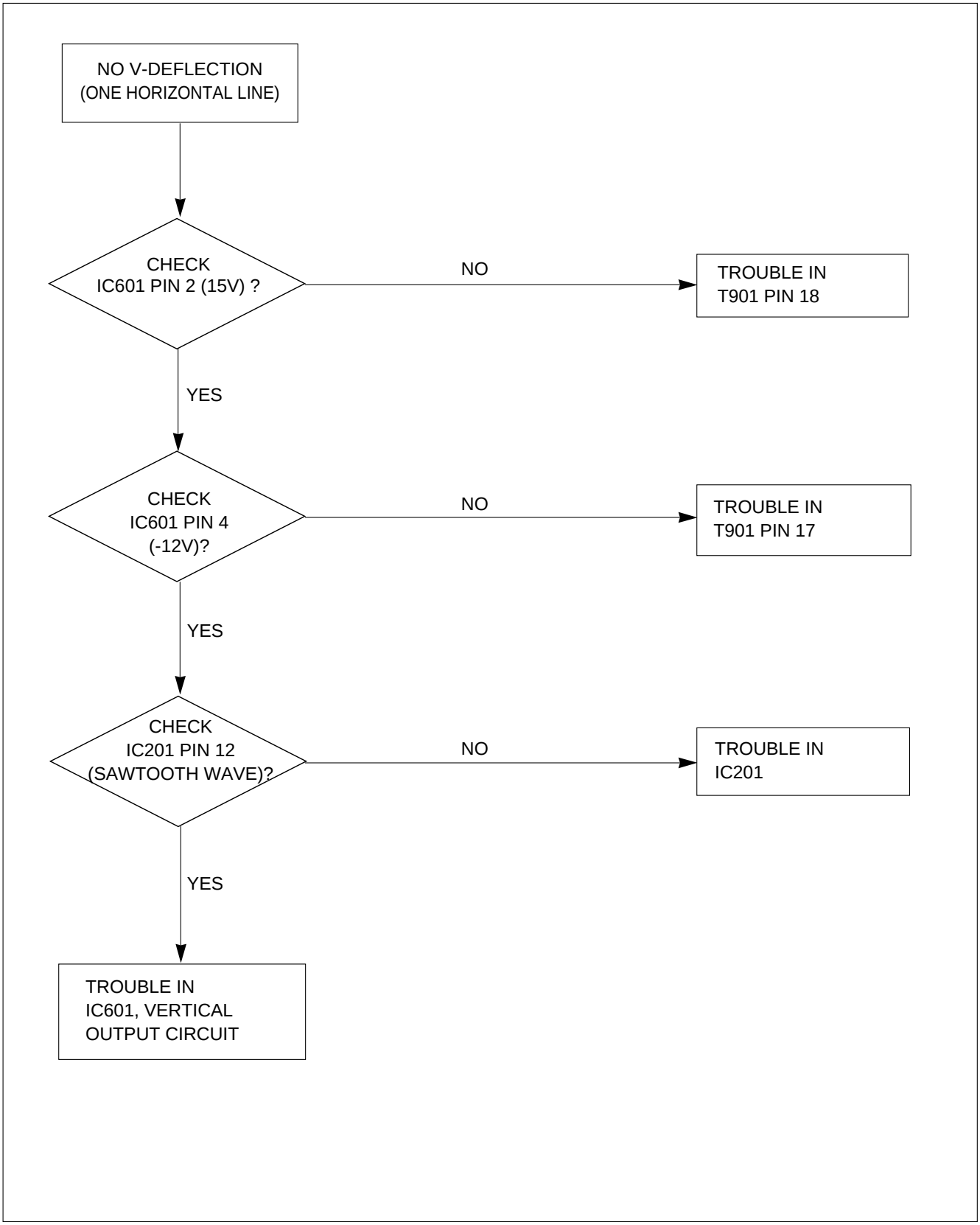
2. NO CHARACTER



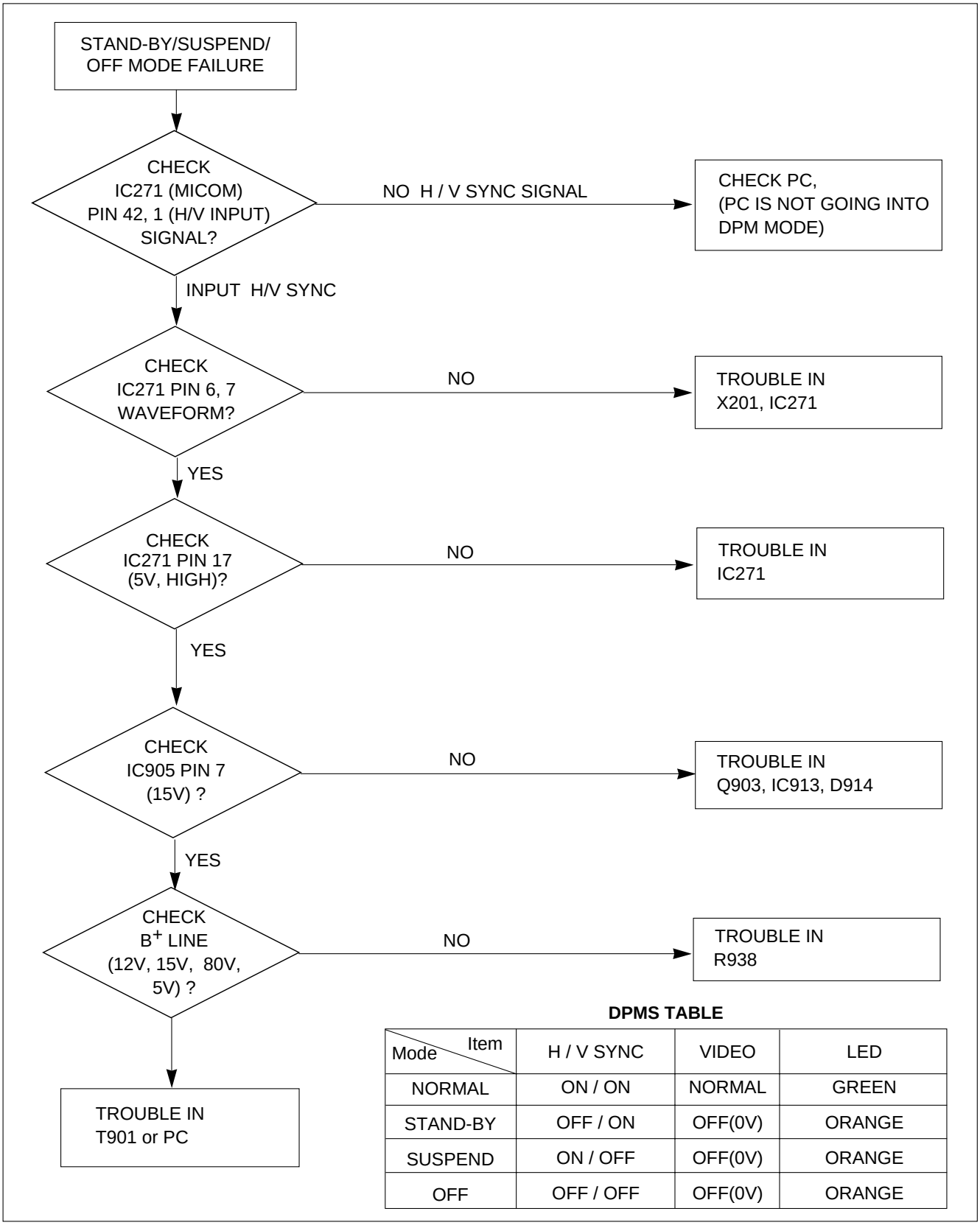
3. NO RASTER


NO VIDEO
(POWER INDICATOR
GREEN or ORANGE)
CHECK
POWER INDICATOR
GREEN or ORANGE ?
ORANGE
TROUBLE IN
D-SUB & 5-BNC
SIGNAL CABLE
GREEN
CHECK
SCREEN CONTROL
KNOB OF FBT
MIN.
(Counter-clockwise)
ROTATE SCREEN
CONTROL KNOB TO
CLOCKWISE
OK
CHECK
VOLTAGE AT
D924 CATHODE (195V)
D925 CATHODE (80V)
IC911 OUT (12V)
IC960 CATHODE
(6.3V)?
NO
TROUBLE IN PRIMARY
CIRCUIT OF T901, T902
YES
CHECK
IC271(MICOM) PIN 5
(5V), IC201 PIN 16
(12V)?
NO
TROUBLE IN
SECONDARY CIRCUIT
OF T901, T902
YES
TROUBLE IN
IC271 (MICOM),
IC201 (T/BASE), TDA4856

4. NO VERTICAL DEFLECTION



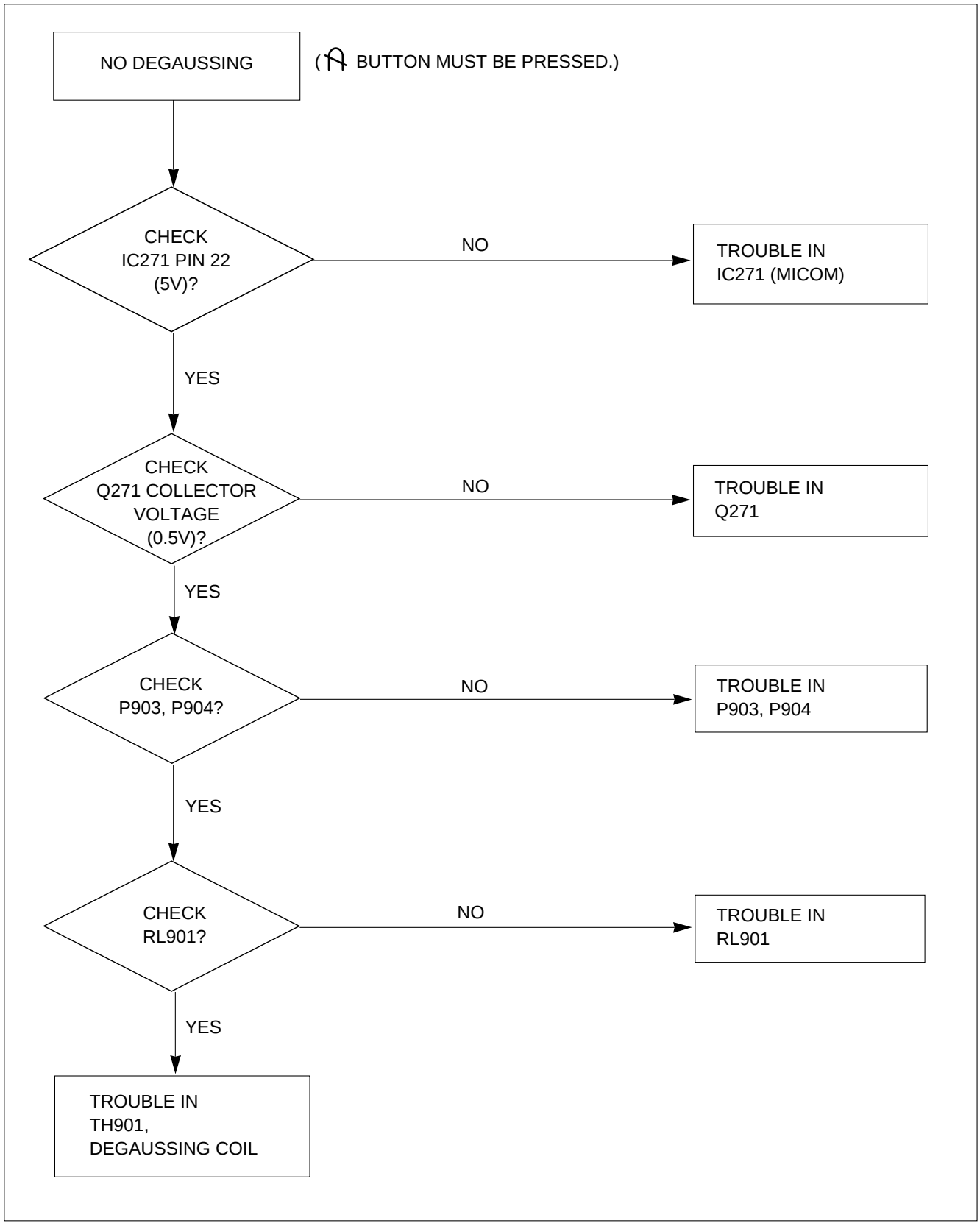
5. TROUBLE IN DPM



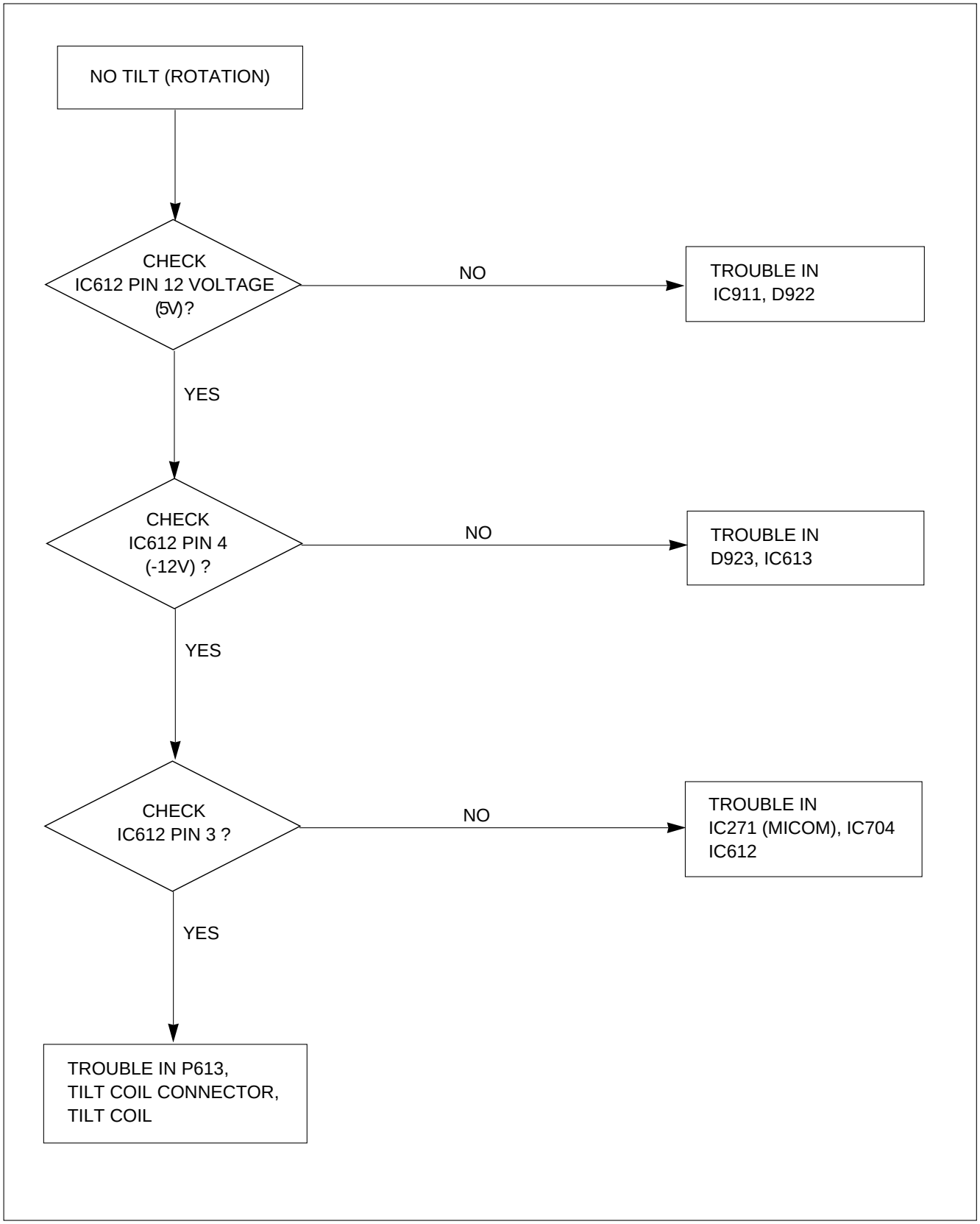
DPMS TABLE

Item / Mode	H / V SYNC	VIDEO	LED
NORMAL	ON / ON	NORMAL	GREEN
STAND-BY	OFF / ON	OFF(0V)	ORANGE
SUSPEND	ON / OFF	OFF(0V)	ORANGE
OFF	OFF / OFF	OFF(0V)	ORANGE

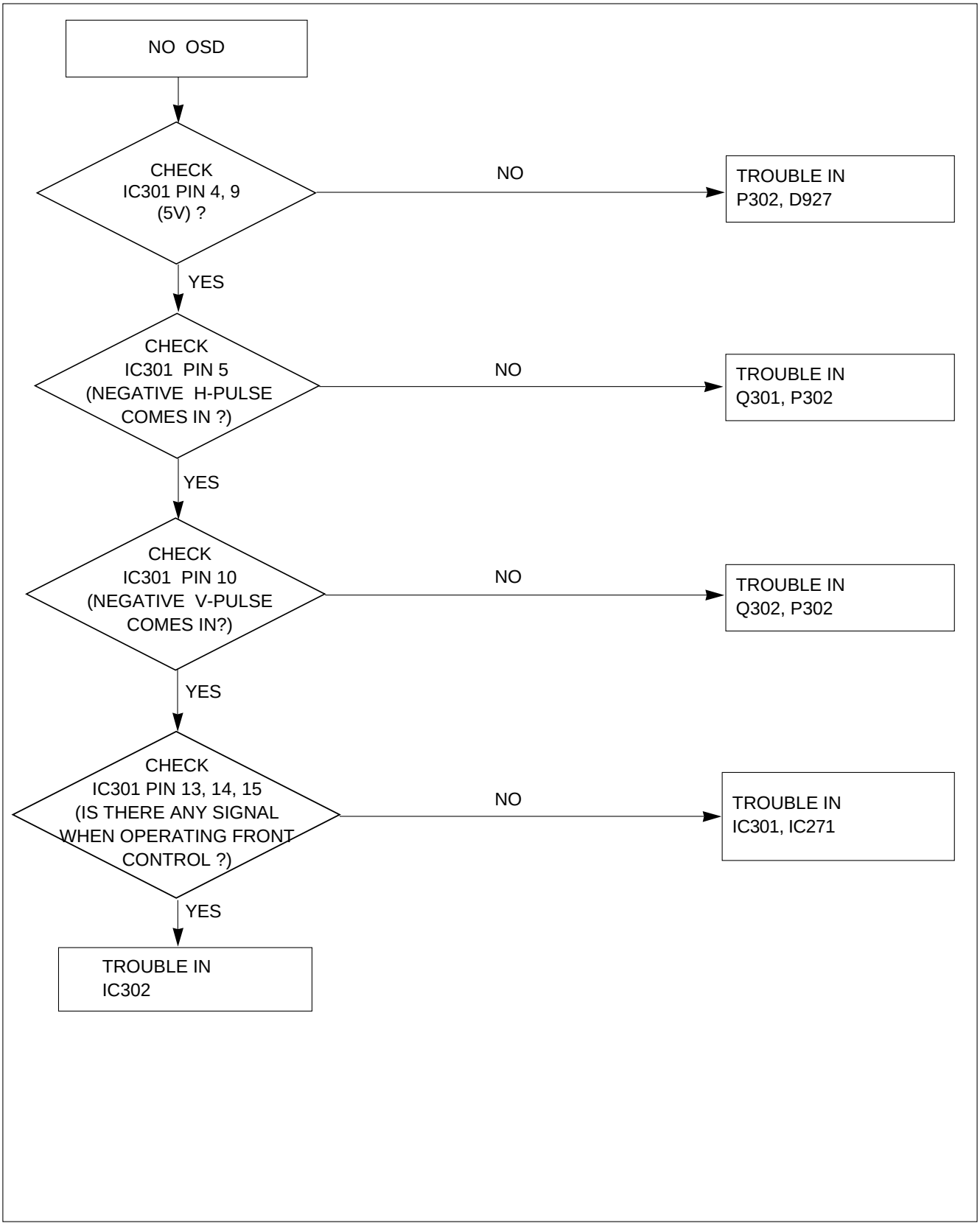
6. NO DEGAUSSING



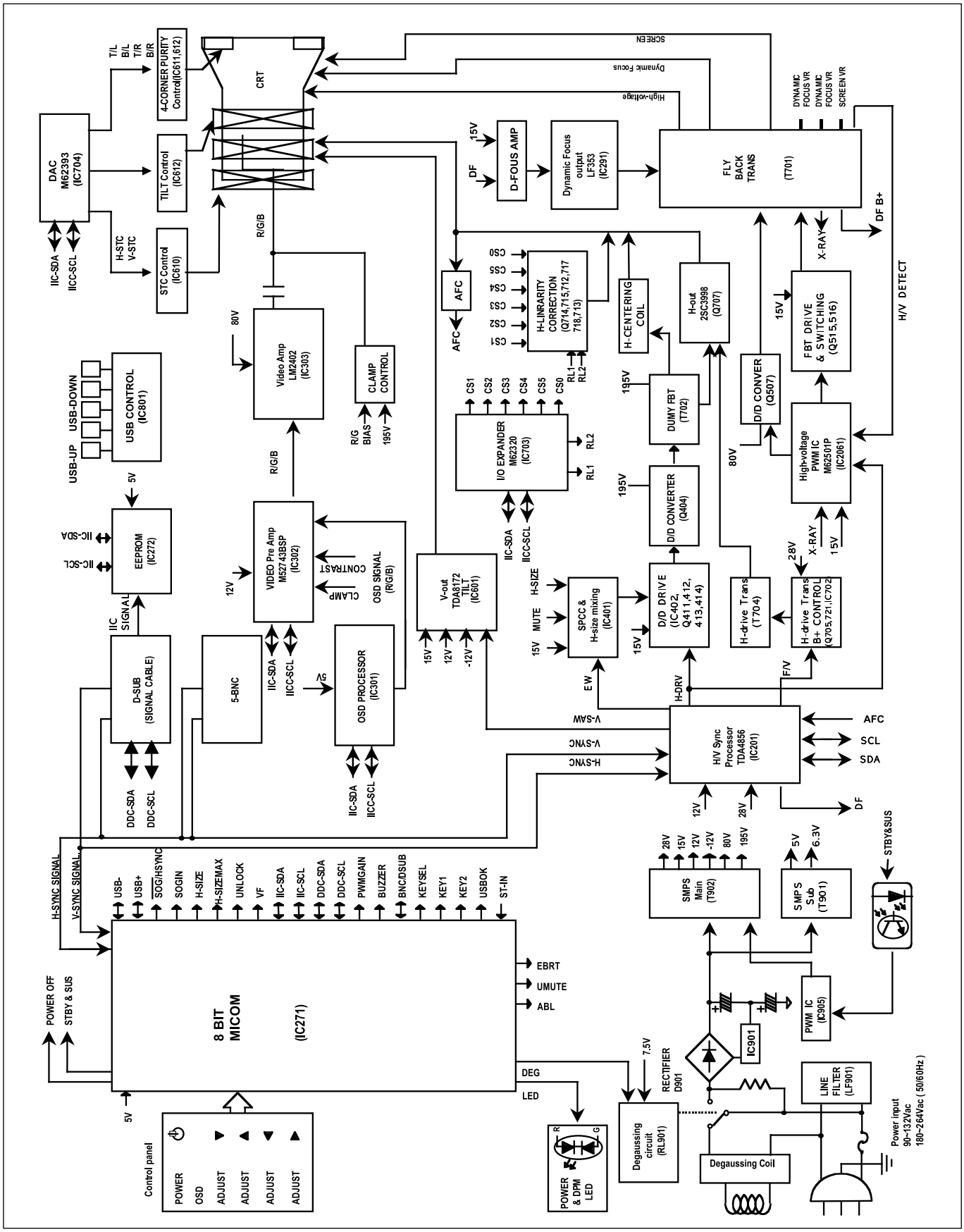
7. NO TILT (ROTATION)



8. TROUBLE IN OSD



BLOCK DIAGRAM



DESCRIPTION OF BLOCK DIAGRAM

1. Line Filter & Associated Circuit

This is used for suppressing noise of power input line flowing into the monitor and/or some noise generated in this monitor flowing out through the power input line. That is to say, this circuit prevents interference between the monitor and other electric appliances.

2. Degauss Circuit & Coil

The Degauss circuit consists of the degaussing coil, the PTC (Positive Temperature Coefficient) thermistor (TH901), and the relay(RL901). This circuit eliminates abnormal color of the screen automatically by degaussing the slot mask in the CRT when turn on the power switch. When you need to degauss while using the monitor select DEGAUSS in the SPECIAL on the OSD menu.

3. SMPS(Switching Mode Power Supply).

This circuit works with power of 90~132Vac/196~264 Vac (50/60Hz).

The operation procedure is as follows:

1) AC input voltage is rectified and smoothed by the bridge diode (D901) and capacitors (C912,913).
2) The rectified voltage (DC voltage) is applied to the primary coil of the transformer (T901,T902).
3) The control IC (IC905) generates switching pulse to turn on and off the primary coil of the transformer (T902) repeatedly.
4) Depending on the turn ratio of the transformer, the secondary voltages appear at the secondary coil of the transformer (T902).
5) These secondary voltages are rectified by each diode (D922,923,924,925,931) and operate the other circuits. (Deflection , Video Amplifier ,..... etc.)

   The switching IC (IC901) controls input-pulse-width and generates secondary voltages by sub-transformer (T901).

4. Display Power Management Circuit.

This circuit control power consumption of the monitor by detecting H and V sync signal.

There are Stand-by and suspend mode.

When no horizontal or vertical sync signal input, the circuit consists of Q903 and IC913 becomes stand-by and suspend mode. Its power consumption is below 8W.

5. X-ray Protection.

This circuit detects the rectified DC voltage comes from the FBT pin 6. If the high volltage of the FBT reaches up to about 30kV (abnormal state), high voltage control PWM IC (IC2061) detects it. And PWM IC (IC2061) prevent output voltage to the gate of switching FET(Q507).It stops operating primary circuit of the FBT (T703), and high voltage is not be generated.(In the normal state, the high voltage is about 27kV.)

6. Micom (Microprocessor) Circuit.

The operating procedure of Micom (Microprocessor) and its associated circuit is as follows:

1) H and V Sync signal is supplied from the D-sub to the Micom (IC271).
2) The Micom (IC271) distinguishes polarity and frequency of H and V sync.
3) The Micom controls each OSD function signals.(H-size, H-position, V-size, etc.)
4) The controlled data of each mode is stored in itself. User can adjust screen condition by each OSD function. The data of the adjust screen condition is stored automatically.

7. Horizontal and Vertical Synchronous Processor

This circuit generates the horizontal drive pulse and the vertical drive pulse by taking sync-signal form the D-SUB (P208). This circuit consists of the TDA4856 (IC201) and the associated circuit.

8. Oscillating Circuit for D/D Converter.

This circuit generates the saw-tooth wave which has the horizontal period by taking the output of the TDA4856 (IC201).

9. D/D (DC to DC) Converter.

This circuit supplies DC voltage to the horizontal deflection output circuit by decreasing DC 195V which is the secondary voltage of the SMPS in accordance with the input horizontal sync signal.

10. Side-Pincushion Correcting Circuit.

This circuit improves the side-pincushion of the screen by mixing east-west wave to the output of the horizontal deflection D/D converter which is used for the supply voltage source (B+) of the deflection circuit.

11. D/D Drive & Convert Circuit.

This circuit is used for supplying B+ voltage to horizontal deflection output transistor(Q707). This circuit makes to add side-pincushion correcting signal to B+ voltage.

12. Horizontal Deflection Output Circuit.

This circuit makes the horizontal deflection by supplying the saw-tooth current to the horizontal deflection yoke.

13. High Voltage Output & FBT (Fly Back Transformer).

The high voltage output circuit is used for generating pulse wave to the primary coil of the FBT (Fly Back Transformer (T703)). A boosted voltage (about 27kV) appears at the secondary of the FBT and it is supplied to the anode of the CRT. And there are another output voltages such as the dynamic focus frequency.

14. H-Linearity Correction Circuit.

This circuit corrects the horizontal linearity for each horizontal sync frequency.

15. Vertical Output Circuit.

This circuit takes the vertical ramp wave form the TDA4856(IC201) and performs the vertical deflection by supplying the saw-tooth wave current form the TDA8172 (IC601) to the vertical deflection yoke.

16. Dynamic Focus Output circuit.

This circuit takes H and V parabola wave from the TDA4856(IC201) and amplifies these waves to offer to the FBT(T703).

17. H & V Blanking and Brightness Control.

This circuit eliminates the retrace line by supplying a negative pulse to the G1 of the CRT. The brightness control circuit is used to control of the screen brightness by changing the DC level of G1.

18. Tilt (Image Rotation) Circuit.

This circuit corrects the tilt of the screen by supplying the image rotation signal to the tilt coil which is attached to the CRT near the deflection.

19. Static Convergence Control Circuit.

This circuit corrects the convergence of the screen by supplying the convergence signal to the 4H(STC) coil which is attached to the CRT near the deflection.

20. Moiré Reduction Circuit.

This circuit reduce interference between the periodical display pattern and the CRT's slot (or dot). The positions of every other one dot video signal beams (red, green and blue beam) are shifted finely, thus reducing interference.

21. OSD Circuit.

This circuit is used for performing the OSD (On Screen Display) function. When a user selects the OSD Select/ Adjustment control, the adjustment status displays on the screen.

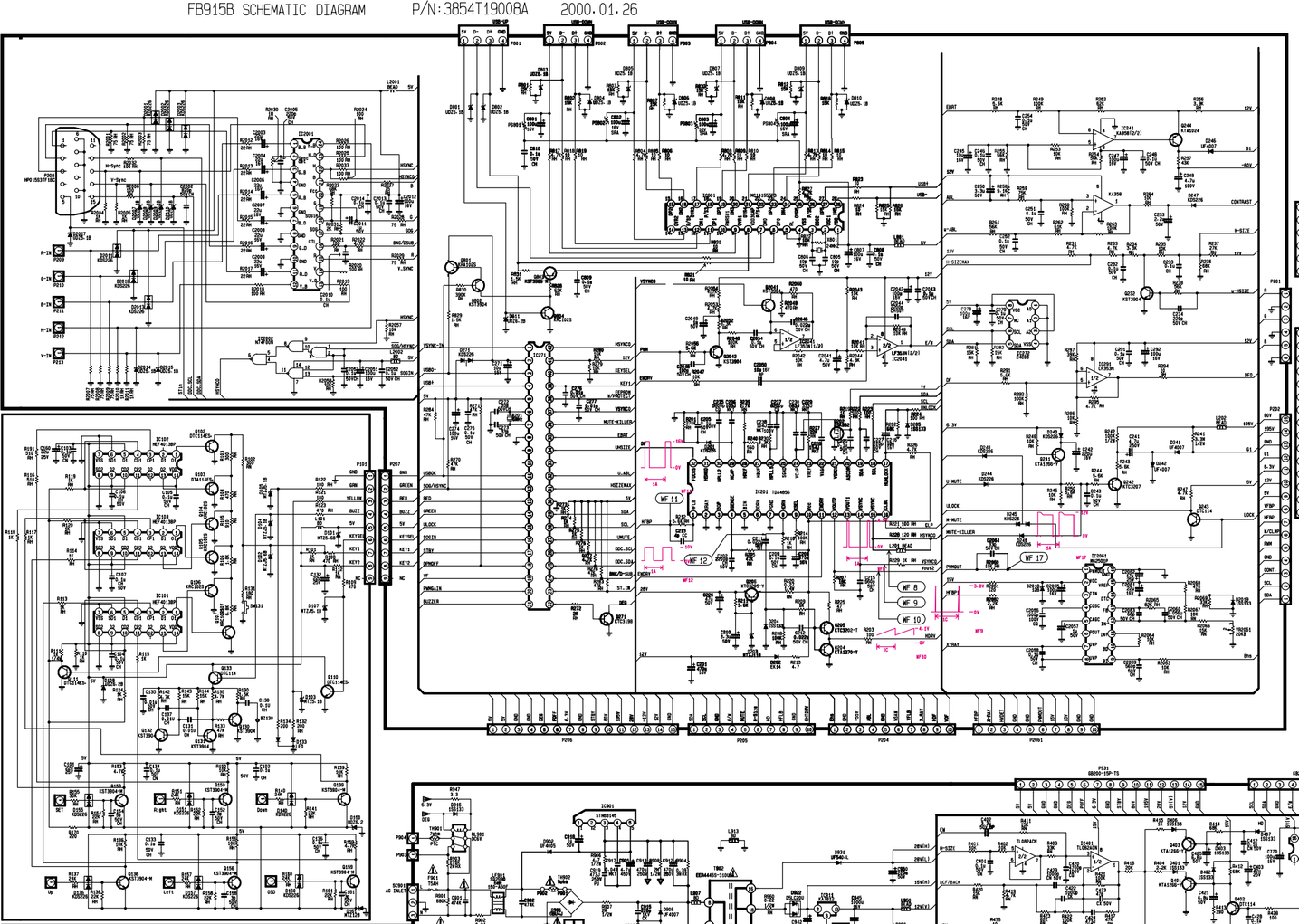
22. Video Pre-Amp Circuit.

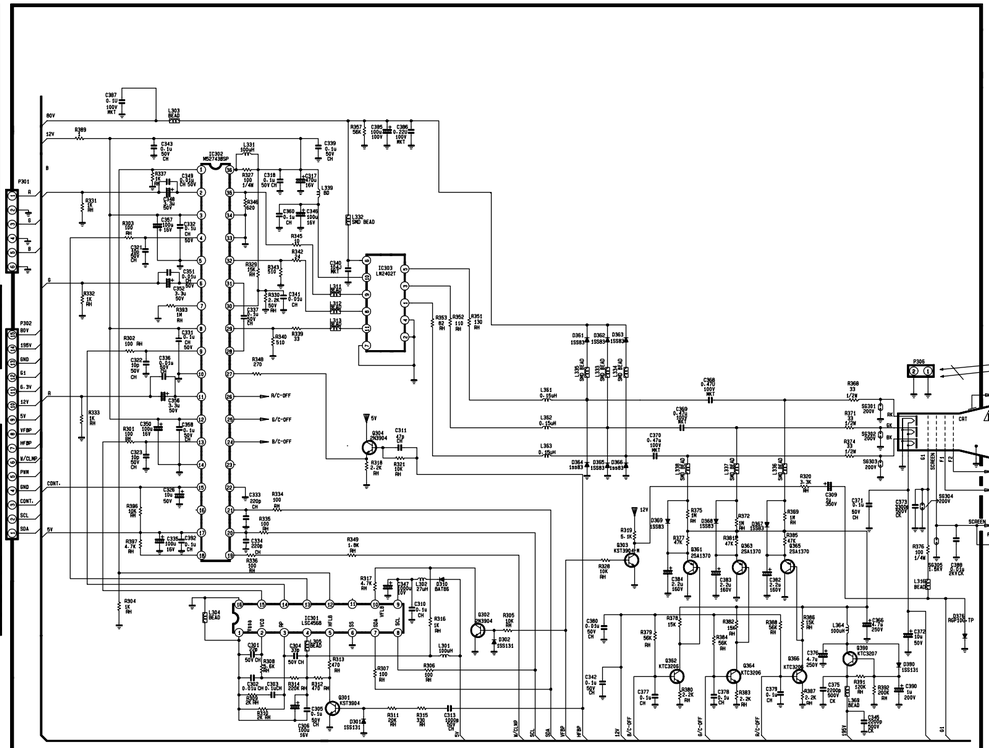
This circuit amplifies the analog video signal from 0-0.7V to 0-4V. This circuit is operated by taking the clamp, R, G, B drives, and contrast signals from the Micom (IC271).

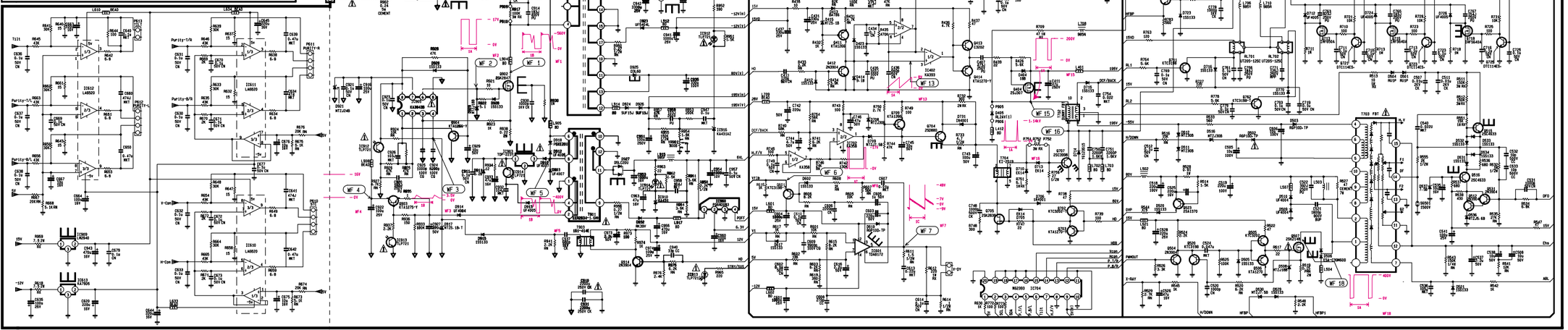
23. Video Output Amp Circuit.

This circuit amplifies the video signal which comes from the video pre-amp circuit and amplified video signal is applied to the CRT cathode.

FB915B SCHEMATIC DIAGRAM P/N:3854T19008A 2000.01.26







IMPORTANT SAFETY NOTICE

THE ⚠ SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION, FIRE AND ELECTRICAL SHOCK HAZARDS.WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFATURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

	SYNC	DPMF	WATT
NORMAL	H	L	140W
SUSPEND	L	HEATER ON	8W
STAND-BY			
OFF	L	HEATER OFF	3W

NOTICE

Since this is a basic schematic diagram.
The value of components and some partial connection are
suject to be changed for improvement without notice.

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